Docket No.: 4670-0114PUS1
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Hidekazu MORI et al.

Application No.: 10/562,554 Confirmation No.: 8229

Filed: December 28, 2005 Art Unit: 2823

For: METHOD FOR PRODUCING ELECTRODE FOR ELECTRIC DOUBLE LAYER CAPACITOR Examiner: PARENDO, KEVIN A

DECLARATION PURSUANT TO 37 C.F.R§1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Hidekazu MORI, declare and say as follows:

1. I am familiar with U.S. Application Serial No. 10/562,554 of which I am a co-inventor.

2. The following experiment was conducted either by myself or under my direct supervision.

3. This experiment demonstrates that the electric double layer capacitor manufactured by the method of the present invention has high performance compared with the electric double layer capacitor manufactured by the method using the mixture having a concentration of solid contents of below 50wt% like Nakao.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Hidekazu Mori

Signature

Hidekazu MORI

Typed or Printed Name

7/29/2010

Date

<Experimental report>

2010/ 7/13

reporter : Hidekazu Mori

<OBJECT>

An object of this experimental report is: firstly to evaluate

1) the electrode for electric double layer capacitor and the electric double layer capacitor both manufactured by the method of the present invention which uses a powdery mixture having a concentration of solid contents of over 50wt%, and

2) the electrode for electric double layer capacitor and the electric double layer capacitor both manufactured by the method using a mixture having a concentration of solid contents of below 50wt%; and

secondary to prove that the electric double layer capacitor produced by the method of the present invention shows excellent performance.

<EXPERIMENT>

1. Formation of an Electrode Layer

(EXAMPLE 1)

EXAMPLE 1 is corresponding to the Example 1 described in paragraph [0060] of the present application.

While 170 parts by weight of activated carbon (particle diameter: 8 μm, and specific surface area: 2000m^2/g) were stirred with a Henschel mixer, thereto were sprayed and added 20 parts by weight of an aqueous 40% dispersion of carboxyl-modified styrene/butadiene copolymer particles (Tg: -5°C, and particle diameter: 12 μm) having a cross linked structure over 10 minutes. Next, 20 parts by weight of acetylene black were added thereto over 10 minutes, and the components were mixed to obtain a mixture having a particle diameter of 163 μm.

The concentration of solid contents of the mixture was 94.4wt%, and the mixture was in a powdered state.

Into a mold having a size of 4 cm×6 cm, was supplied 4.5 g of the resultant powdery mixture, and then the mixture was pressed at a pressure of 10 MPa while heated up to 80°C, thereby obtaining an electrode layer sheet of 300 μm thickness.

(ADDITIONAL EXAMPLE 1)

To 285 parts by weight of purified water, 20 parts by weight of an aqueous 40% dispersion of carboxyl-modified styrene/butadiene copolymer particles as described above was added; thereto, 170 parts by weight of active carbon as described above and 20 parts by weight of carbon black were added, and then stirred with a Hobart mixer. The mixture became clayey, lost fluidity and became aggregated.

The concentration of solid contents of the mixture was 40 wt%.

Since the obtained mixture could not be used as it was to form an electrode layer sheet, the aggregated mixture was chipped, dried, and pulverized. The obtained powdery mixture was supplied into a mold having size of 4 cm×6 cm. 4.5 g of the resultant powdery mixture was supplied, and then the mixture was pressed at a pressure of 10 MPa while heated up to 80°C, thereby obtaining an electrode layer sheet of 300 μm in thickness.

NOTE: We found out that when using the Henschel mixer or the like, which could not provide shearing force to the component, was used, it was difficult to mix the clayey component uniformly. So, in ADDITIONAL EXAMPLE 1, Hobart mixer was used, which could provide shearing force to clayey component and could keep mixing the clayey component.

(ADDITIONAL EXAMPLE 2)

To 120 parts by weight of purity water, 20 parts by weight of an aqueous 40% dispersion of carboxyl-modified styrene/butadiene copolymer particles as described above was added; thereto, 170 parts by weight of active carbon as described above and 20 parts by weight of carbon black were added, and then stirred with a Hobart mixer. The mixture kept the granular form and was not aggregated.

The concentration of solid contents of the mixture was 60wt%, and the mixture was slightly moistened but in a powdered state.

The obtained powdery mixture was dried and supplied into a mold having size of 4 cm×6 cm. 4.5 g of the resultant powdery mixture was supplied, and then the mixture was pressed at a pressure

of 10 MPa while heated up to 80°C, thereby obtaining an electrode layer sheet of 300 μm in thickness.

(Production of Electrodes and an Electric Double Layer Capacitor)

In the same method as described in Examples or Comparative Examples in the present application, the electrode and the electric double layer capacitor with the above electrode layer sheet were produced. Then, the produced electrode and electric double layer capacitor were evaluated.

<RESULT>

The result is shown in Table-1 below.

(Table-1)

	Electrode layer strength	Bending strength	Electrostatic capacity (F/g)	Internal resistance (ΩF)
EXAMPLE 1	○	○	53.2	5.6
ADDITIONAL EXAMPLE 1	○	○	38.6	6.4
ADDITIONAL EXAMPLE 2	○	○	51.2	5.9

○: A result better than that of Comparative Example 1 described in the present application was obtained.

<DISCUSSION>

According to the present invention, the electric double layer capacitor having excellent electrode layer strength, high capacity and small internal resistance was obtained. Especially, capacity and internal resistance was improved compared with the case where the mixture having a concentration of solid contents of below 50wt% was used to form electrode layer.